United States
Department of
Agriculture

Forest Service

Reports 2400-D
and 2400-M

Reforestation and Timber Stand Improvement Report

National Summary
Fiscal Year 2003

January, 2004

Table of Contents **Page**

Message from the Director of Forest and Rangeland Management

The following is the Reforestation and Timber Stand Improvement Report for fiscal year (FY) 2003. The contents of this report also appear on the Forest Service home page on the Internet at http://fsweb.wo.fs.fed.us/frs/fm/silviculture/index.shtml. The report provides the following information:

- First, it summarizes production levels at each Forest Service nursery and seed extractory and displays service-wide production trends at these facilities. This section also provides information on genetic resource improvement programs.

- Second, it displays reforestation program accomplishment by each region and examines reforestation program trends nationally. This section also summarizes reforestation success in terms of plantation establishment.

- Third, it illustrates timber stand improvement (TSI) program accomplishment by each region and displays TSI trends nationally.

- Fourth, graphs and tables provide more detailed information pertaining to Forest Service nurseries and seed extractories, regional reforestation and TSI programs, and reforestation success. In addition, included is information previously included as Tables 5, 6, 7, and 8 in the Report of the Forest Service to Congress. They are now labeled Tables 1, 2, 3, 4 and 5. Tables 1, 2, 3, and 4 display reforestation and timber stand improvement needs by region, State, and national forest by productivity class. Table 5 displays certification of reforestation and timber stand improvement acreages by State and national forest for fiscal year 2003.

I hope you find this report both informative and useful in examining the trends, achievements, and challenges for forest vegetation management on National Forest System lands.

JANETTE S. KAISER
Director, Forest and Rangeland Management

Preface

This report provides a summary of the Forest Service's nursery; genetic resource improvement, reforestation, and timber stand improvement programs. This report addresses the reporting requirements outlined in FSM 2470, 2490, and FSH 2409.14. Resource data summarized in this report was derived from automated reports extracted from the TRACS-SILVA data base, and non-automated information compiled by Forest Service nursery managers, reforestation/TSI specialists, geneticists, and silviculturists.

Following the Executive Summary, this report is organized in four major sections:

- **SUMMARY OF THE FY 2003 FOREST SERVICE NURSERY AND GENETIC RESOURCE PROGRAMS**

  This section of the report summarizes FY 2003 production data at FS nurseries and seed extractories and assesses the production trends and future outlook for these facilities. Forest Service genetic resource improvement programs are included in this section.

- **SUMMARY OF THE FY 2003 REFORESTATION PROGRAM**

  This section displays FY 2003 reforestation accomplishments and program trends, which also includes information on plantation survival.

- **SUMMARY OF THE FY 2003 TIMBER STAND IMPROVEMENT (TSI) PROGRAM**

  This section displays FY 2003 TSI accomplishments and program trends.

- **APPENDICES SECTION**

  This section includes numerous tables providing more detailed information pertaining to Forest Service nurseries and seed extractories, regional reforestation and TSI programs, and reforestation success**.** In addition, first time in this report is information previously included as Tables 5, 6, 7, and 8 in the Report of the Forest Service to Congress. They are now labeled Tables 1, 2, 3, 4 and 5. These tables display reforestation and timber stand improvement (TSI) needs by region, State, and national forest by productivity class and certification of reforestation and timber stand improvement acreages by State and national forest for fiscal year 2003. The common names for tree species identified by code on selected tables in this report are shown in Appendix C.

Executive Summary

Some of the highlights for FY 2003 include:

- Forest Service nurseries produced about 29 million seedlings in FY 2003, a slight decrease of about 7% from FY 2002 production levels (31 million seedlings).

- Forest Service seed extractories produced roughly 16 thousand pounds of seed representing over 243 species of grasses, forbs, shrubs, and trees.

- Silvicultural examinations were done on about 592 thousand acres and silvicultural prescriptions were developed on about 551 thousand acres to achieve a diverse array of management objectives on National Forest System lands.

- Reforestation treatments occurred on more than 160 thousand acres. About one-half of this work was K-V financed, approximately 38% was financed using appropriated funds, and the remainder (11%) was accomplished using contributed funding sources.

- Timber stand improvement (TSI) treatments occurred on about 258 thousand acres. About 64% of the treated acres were precommercially thinned, about 30% were treated to eliminate competing weed species and release trees to maintain or improve stand growth. Pruning and fertilization treatments were done on the balance of these acres.

- Reforestation needs increased by about 60 thousand acres while TSI needs decreased by about 51 thousand acres nationally over the corresponding values reported last year.

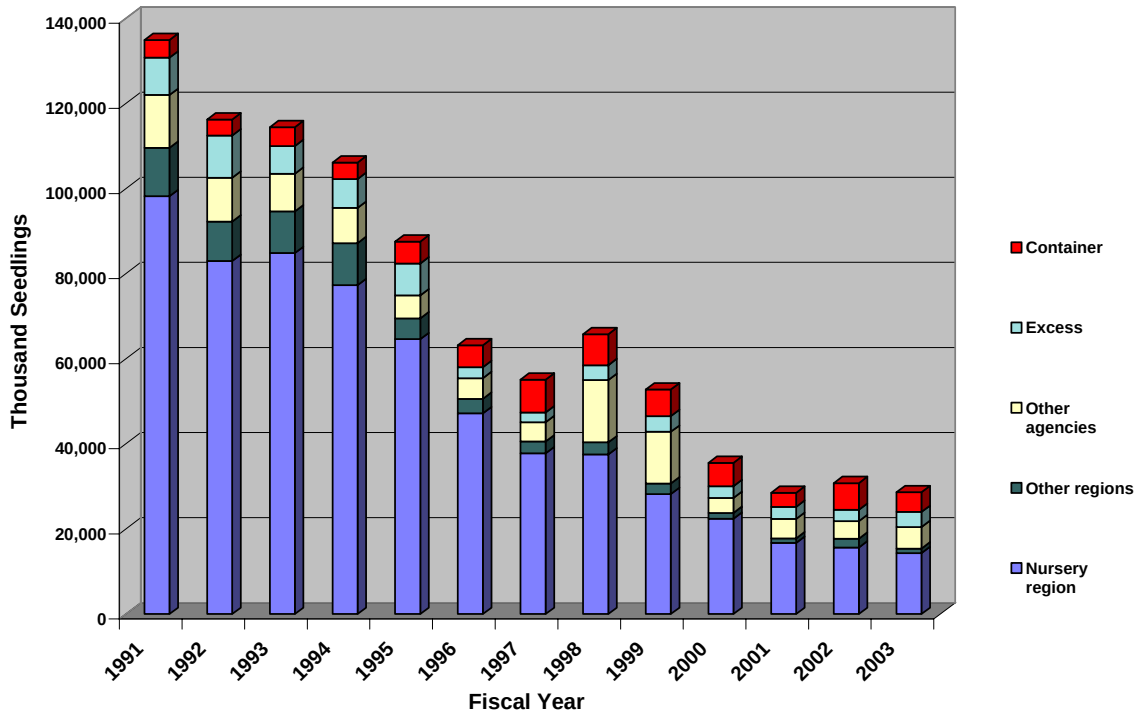
- Nationally, first-year and third year survival for planted acres averaged 63% and 60% respectively.

SUMMARY OF THE FY 2003 FOREST SERVICE NURSERY AND GENETIC RESOURCE PROGRAMS

Seedling Production at Forest Service Nurseries

Forest Service (FS) nursery production, including both bare-root and container stock, was down by about 7% from the previous year at about 28.6 million seedlings (Tables 1 & 2 in Appendix A). This continues the trend of declines experienced in prior years resulting from reduced timber harvest, shifting emphasis toward intermediate treatments (commercial thinning) and salvage removals, and increasing reliance on natural regeneration to achieve reforestation objectives. Production trends from FY 1991 through FY 2003 are shown in Figure 1.

Figure 1 -- FS Nursery Seedling Production



Seedling Production Trends, Sowing Requests, and Acquisition from Other Sources

Seedling production levels have generally been declining at FS nurseries since FY 1991. As of the end of FY 2003, production levels at these facilities (28.6 million seedlings) had declined by –79% from the levels reported for FY 1991 (134.9 million seedlings). The outlook for future seedling orders and sowing requests are shown in Tables 1A and 1B in Appendix A. The data presented in these tables shows a slight decline in inventory levels at these facilities in the next year, followed by continued declines in anticipated seedling production levels thereafter. Table 4 summarizes seedling acquisition from sources other than FS nurseries.

Seed Production at Forest Service Seed Extractories

Approximately 16 thousand (M) pounds of tree seed were produced during FY 2003; an increase of 44% from FY 2002 extraction levels (7 M pounds). Seed production levels can be highly variable from year-to-year, reflecting the unique characteristics of individual plant species and the periodicity of good seed crops in each species. These variations can be seen in the trends in seed production at FS facilities for the 12-year period shown in Figure 2.

Figure 2 -- Seed Production at FS Seed Extractories

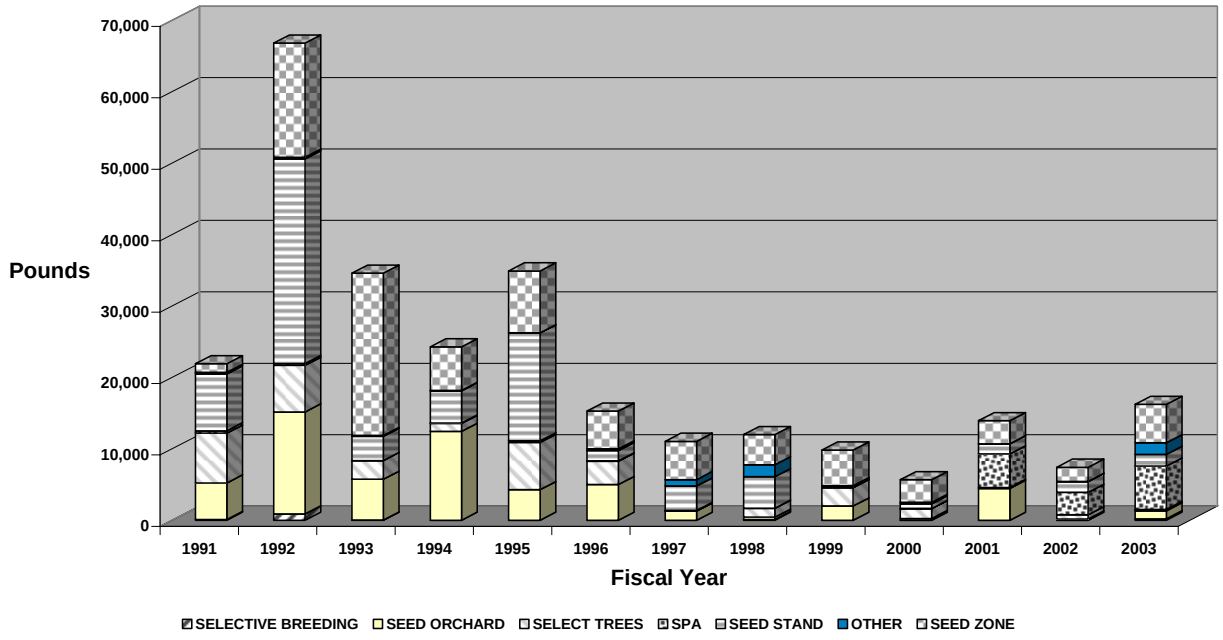


Table 3 in Appendix A summarizes the source of origin for tree seed processed at FS facilities in FY 2003. About 1% of this seed was collected from seed orchards. The list of plant species being processed at these facilities includes about 243 species of grasses, forbs, shrubs, and woody plants.

Table 5 in Appendix A summarizes seed production area (SPA) status for FY 2003. No seed production areas were established in FY 2003; however, SPA's were eliminated on 70 acres resulting in a total of 2,280 acres in SPA status.

Genetic Resource Programs (GRP)

These programs make valuable contributions to improved forest health by identifying and conserving important genetic traits that control resistance to major pests, providing baseline genetic information for forest management activities using genetic test plantations and lab studies, producing adequate quantities of improved seed to meet demand, and by incorporating genetic principles into silvicultural treatment prescriptions and planning efforts.

Accomplishments on this area were previously reported in Tables 6, 7B, and 7C, which beginning with this report will no longer be included. However, this information is available from each Forest Service region upon request.

The Northern Region (R-1) continues its genetics and tree improvement work with larch, Douglas-fir, lodgepole, ponderosa, and western white pine. The Region experienced losses in the genetic work due to wildfires affecting seed collection and progeny test sites. Twenty new clones and 56 unique families of western white pine were added in FY 2003.

During FY 2003 Cour D'Alene Nursery received cone collections from 137 new western white pine elite parent trees in R-1. FY 2003 was a bumper cone crop in most of the range of the species. Scion material was received from 4 new parent trees as part of the program to broaden the genetic base in the high elevation Montana breeding zones in response to restoration efforts following the 2000 fire season.

Overall there were 163 new parental selections in the Region One program, bringing the total tree total to 16,234 trees among seven species. During FY 2003 five plantations were established to evaluate the genetic worth of Western Larch –Montana Low Breeding Zone (Clearwater and Kootenai NF's).

The Intermountain (R-4) and Northern Region worked cooperatively in activities with the Salmon River Seed Orchard (SRSO). In additions cone collection was conducted on orchards located on the Nez Perce NF to service Ponderosa pine reforestation and restoration needs on the Boise and Payette NFs.

The Pacific Southwest Region (R-5) genetic resources program includes conserving genetic resources of valuable species; protect existing and developing new- gene repositories, tech transfer to avoid dysgenic practices, and continue cooperative programs, Sudden Oak Death (SOD), and other forest health efforts. In addition the program is engaged in restoring and sustaining species and populations at risk, like developing and producing blister rust resistant sugar pine and Port-Oxford Cedar seed production, developing gene transfer guides, and provided genetic support for activities associated with Pitch Canker. The region's tree improvement program produces high quality seed and information, for ponderosa pine, Douglas-fir, and white fir.

The program is a very important in assisting in seed planning and management to support forest restoration activities. Seed orchards and progeny evaluation plantations were evaluated for information and maintained as premiere collections of genetic diversity. They represent important resources to prevent the erosion of genetic diversity from introduced diseases and wildfire.

The Pacific Northwest Region (R-6) maintains a total of 47 cone banks and 224 seed orchards. During FY 2003 there were no changes in the region's clone banks. However, 3 new tree seed orchards were established this year. A total of 194 families were added, and no families or acres were dropped. Region 6 maintains a total of 25 species of selected trees, 14 trees were added while 38 were dropped for a total of 78,543 trees in the Region.

There are 16 species included in Region 6 plantations to evaluate genetic worth with 11 new areas were added this year. During FY 2003 one progeny test site was lost to a catastrophic fire. During the year 526 clones or families were added, with an associated addition of 10.7 acres. To date, there are 43,075 clones or families in these plantations for a total of 7,955 acres.

The Southern Region (R-8) continues is aggressive program for hardwood regeneration. During FY 2003, six areas (10 total acres) were planted to demonstrate seedling quality characteristics, planting methods, site preparation techniques, and animal damage protection requirements. These sites were planted in cooperation with the Southern Research Station's Institute of Tree Root Biology and the Georgia Forestry Commission.

Approximately 100 families of white oak and northern red oak were planted. For the oaks, 60 families of white oak and northern red oak were collected and grown at the Georgia Forestry Commission's Flint River Nursery. Three acres of northern red oak was established at the Beech Creek and Chilhowee Seed Orchards. Open pollinated seed was collected from 85 white oak families and 15 northern red oak families.

The region did not established new pine families and no additional acres of pine seed orchards or clone banks were established. All activities associated with loblolly pine progeny testing have ceased in the Southern Region. There have been substantial losses of progeny tests plantations due to the southern pine beetle epidemic, fires, and climatic events. The sand pine seed orchard in Florida was closed this year. Future collections of Ocala Sand pine will be made for wild stands.

The Eastern Region (R-9) continues work to produce white pine blister rust seedlings. Twenty-seven new clones were added to the R-9 white pine clone bank in FY 2003. Over 500 pounds of seed that will produce blister rust resistant seedlings was produced from the Oconto River Seed Orchard. One new test plantation was established at the Oconto River Seed Orchard. It covers 4 acres and compares white pine from 66 families.

The National Forest Genetic Electrophoresis Laboratory (NFGEL) is a facility dedicated to providing genetic analyses to resource managers throughout the agency. The facility was established in 1988 as part of the National Forest System. The purpose of the Laboratory is to analyze molecular genetic markers (proteins and DNA) in plant material submitted by Forest Service employees and those from other cooperating entities. Early NFGEL projects focused primarily on conifers, exploring genetic variation patterns to refine seed zones and to resolve questions about clones, populations, and genetic sources. More recently, following the development of the FS Genetic Resources Strategic Plan, NFGEL was given the mandate to begin work examining forest vegetation other than trees. NFGEL provides baseline genetic information, determines the effect of management on the genetic resource, supports genetic improvement programs, and contributes information in the support of conservation and restoration programs, especially those involving native and threatened, endangered, and sensitive species.

NFGEL projects were processed to meet a variety of management objectives. Project results were used to guide restoration and conservation projects, and assist in silviculture and tree improvement activities. During FY 2003, NFGEL continued to follow its mission to "provide state-of-the-art molecular genetic information to the National Forests and other cooperating agencies for the evaluation and protection of our nation's genetic resource." NFGEL performed the following:

- Continuing the development of a database for ponderosa pine that will be used to identify off-site plantations. Information will be used to improve overall forest health since offsite stands are generally associated with disease and declining performance.

- Determined ramet, clone, and progeny identity in Port-Orford cedar. Results will be used to aid in disease resistance breeding of the species.

- Determined levels of pollen contamination in Douglas-fir and sugar pine seed orchards using new molecular markers. Protects the integrity of reforestation material.

- Determined taxonomy and gene/species conservation strategies for threatened and endangered species *(Silene, Perideridia*).

- Characterizing the genetic diversity and evolution of native grass material to be used for restoration.

- Determined the genetic structure and species conservation strategies for Quaking Aspen growing throughout the Region 5.

- Genetically characterizing revegetation plant materials by comparing source, indigenous, and rehabilitation site native plants. Results will improve fire rehabilitation and restoration projects.

- Determined the clonal structure of Salix and Populus species to be used for restoration of riparian areas.

- Continuing the DNA profiling the 13 surviving trees planted under the direction of George Washington growing at Mt Vernon.

NFGEL continued to host a variety of visitors. Tours of the facility and demonstration of the services were provided to (1) Forest Service employees representing the Research branch, the Washington Office, and National Forest System, (2) members of the public, both from within and outside of California, (3) private industry, (4) university faculty, (5) foreign scientists from Mexico, and (6) employees from other state and federal government agencies. NFGEL formed collaborations with FS Research Stations, Bureau of Land Management, California Department of Transportation, US Fish and Wildlife Service, University of California at Davis, and private companies. Detailed Fiscal Year accomplishment reports for fiscal years 1998 to 2002 can be found at http://www.fs.fed.us/psw/programs/nfgel/.

SUMMARY OF THE FY 2003 REFORESTATION PROGRAM

FY 2003 Reforestation Accomplishment and Program Trends

About 163 thousand acres of National Forest System lands were reforested during FY 2003 using appropriated, reforestation trust (RTF), and Knutson-Vandenberg (K-V) funds. Contributed funds provided resources to reforest an additional 18,110 acres, bringing the grand total for FY 2003 to 163,495 acres. This represents a slight increase from FY 2002 (160,814 acres). The distribution of these acres by the type of reforestation treatment is shown in Tables 9, 10, 11, and 11A in Appendix A. Included in the reforestation accomplishment total for FY 2003 are 49,624 acres of natural regeneration without site preparation. Reforestation accomplishment by K-V funding occurred on a total of 83,149 acres, representing a slight increase from FY 2002 (80,609 acres). National trends in reforestation accomplishment from FY 1991 through FY 2003 are shown in Figure 3, illustrating the steady decline in reforestation accomplishment since FY 1991.

Additional information concerning reforestation accomplishments in FY 2003 is presented in Table 12 (Site Preparation for Planting or Seeding), Table 18 (Animal Control for Reforestation), and Table 21 (Certification of Reforestation treatments), as well as summary of harvest acres by cutting method in Table 20 in Appendix A.

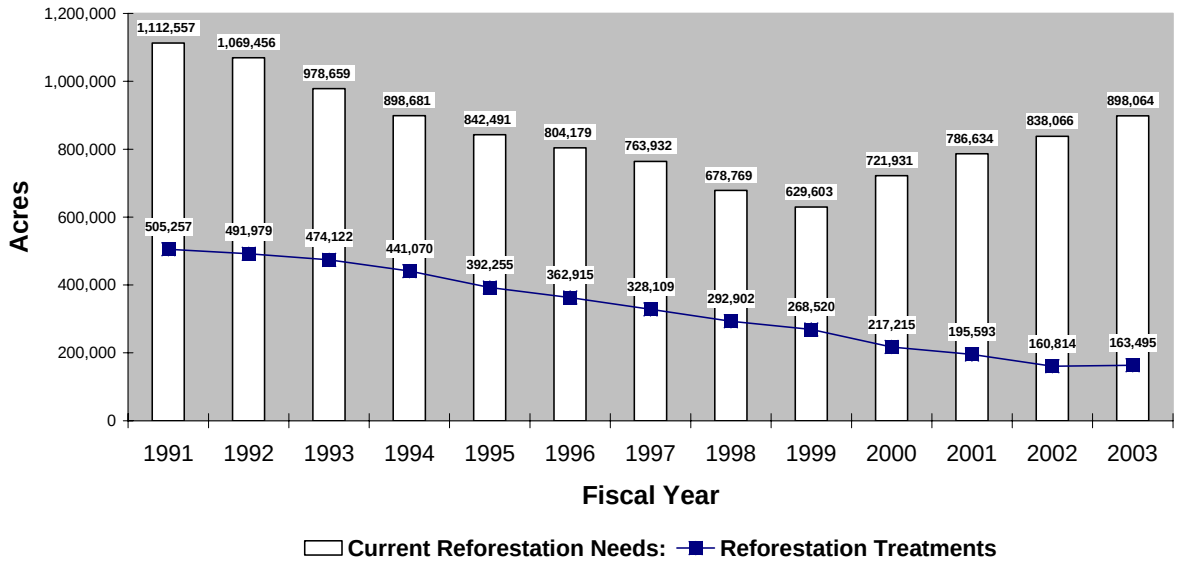
FY 2003 Reforestation Needs and Trends

Current reforestation needs are estimated at 898,064 acres, representing about 5 years of reforestation work at present levels of accomplishment. It generally takes 2-3 years of lead time to prepare the site, grow seedlings adapted to specific sites, and make arrangements for getting the trees planted using either contract or force-account crews. Nationally, the net increase in reforestation needs was about 60 thousand acres in FY 2003.

As was the case with the trends in reforestation needs observed in past few years, the increase in reforestation needs is primarily attributable to the wildfires occurring in the western U.S. during the past three summers. It is notable that the rate of reforestation treatment in FY 2003 was insufficient to keep pace with the increase in added reforestation needs for the third year in a row.

National trends in reforestation needs are depicted in relation to reforestation treatments and reforestation failures in Figure 4. Reforestation failure rates were declared on about 18 thousand acres nationally in FY 2003 representing about 11% of reforestation treatment acres.

Figure 4 -- National Trends in Reforestation Needs



Plantation Survival

The results of the plantation surveys made following the 2002 growing season are summarized in Table 22 in Appendix A. First-year survival nationally averaged 63%, declining slightly from the average posted in last year's report (68%). The national average for third-year survival was reported at 60%, the same average for third-year survival reported in the FY 2002 report (60%).

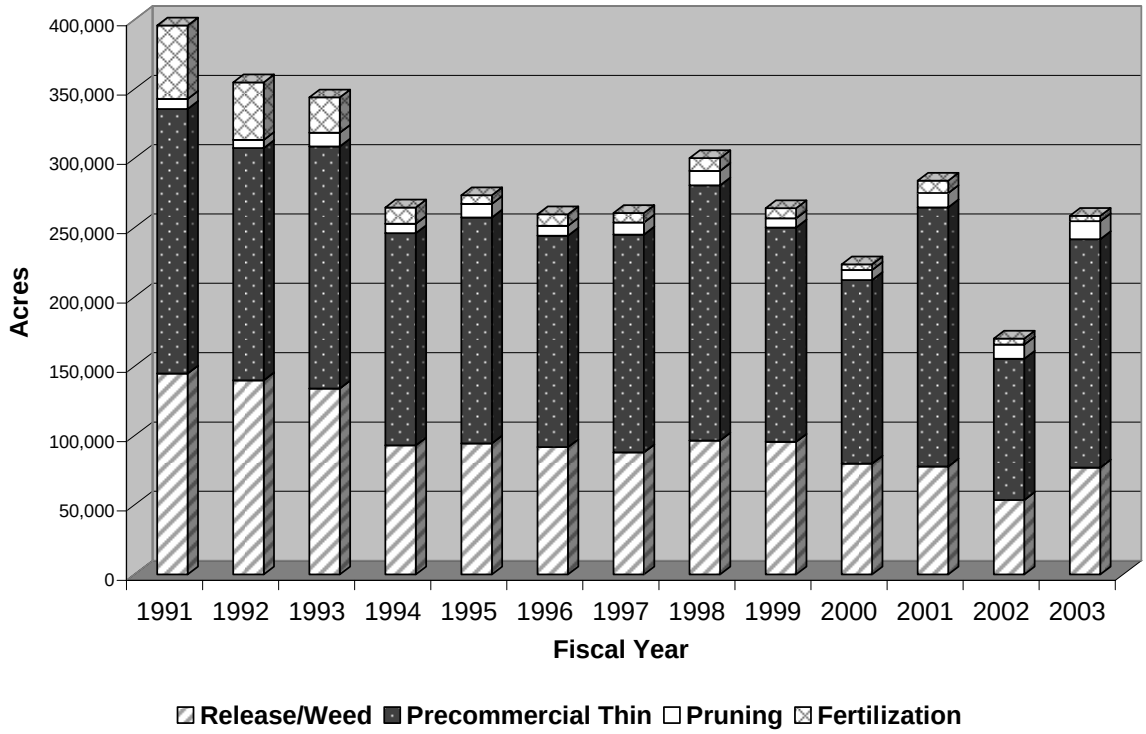
Despite the decline between first and third year survival, reforestation success on most sites is sufficient to satisfy management objectives and to certify these areas as satisfactorily stocked. Where survival levels are not sufficient to meet management objectives, a failure is declared and the area is programmed for re-treatment. The decline in third-year survival as compared with first year figures can be attributed to animal damage, and dryer than normal conditions prevailing over much of the country.

SUMMARY OF THE FY 2003 TIMBER STAND IMPROVEMENT (TSI) PROGRAM

FY 2003 TSI Accomplishment and Program Trends

About 258 thousand acres of National Forest System lands received TSI treatments during FY 2003 from all funding sources. This represents an increase of about 66% from FY 2002 attainment levels (170,000 acres**),** due in principal part to contributed work done under the National Fire Plan. The distribution of these acres by the type of TSI treatment is shown in Tables 13, 14, 15, and 16 in Appendix A. National trends in TSI accomplishment for the past 13 years are shown in Figure 5.

Figure 5 -- National Trends in TSI Accomplishment



The increase in attainment in TSI activities reflects the effects of the implementation of TSI activities under the National Fire Plan. This increase can change in future years if we experience unusually severe fire seasons prompting the need to allocate resources toward fire recovery efforts. Without the work accomplished under the National Fire Plan, the general trend in declining TSI accomplishment will continue reflecting reduced funding for forestland vegetation management work and the need to apply a limited amount of appropriated funding to assure prompt reforestation following wildfire and other disturbance events.

Additional information on TSI accomplishments is provided on Table 17 (Prescribed Burning to Control Understory Species), Table 19 (Animal Control for TSI), and Table 21 (Certification of TSI Treatments) in Appendix A.

FY 2003 TSI Needs and Trends

Current TSI needs are estimated at about 2.18 million acres nationally, a decrease of about 51 thousand acres over the TSI needs level reported in FY 2002 (2.23 million acres). FY 2003 TSI needs represent about 8 years of work at FY 2003 levels of accomplishment. National trends in TSI needs and accomplishments from 1991 through 2003 are shown in Figure 6.

Figure 6 -- National Trends in TSI Needs and Treatments